

Figure 1: Expression profiles in acute myeloid leukemia associated with diverse genetic aberrations and have prognostic impact - Valk et al.

Figure 1

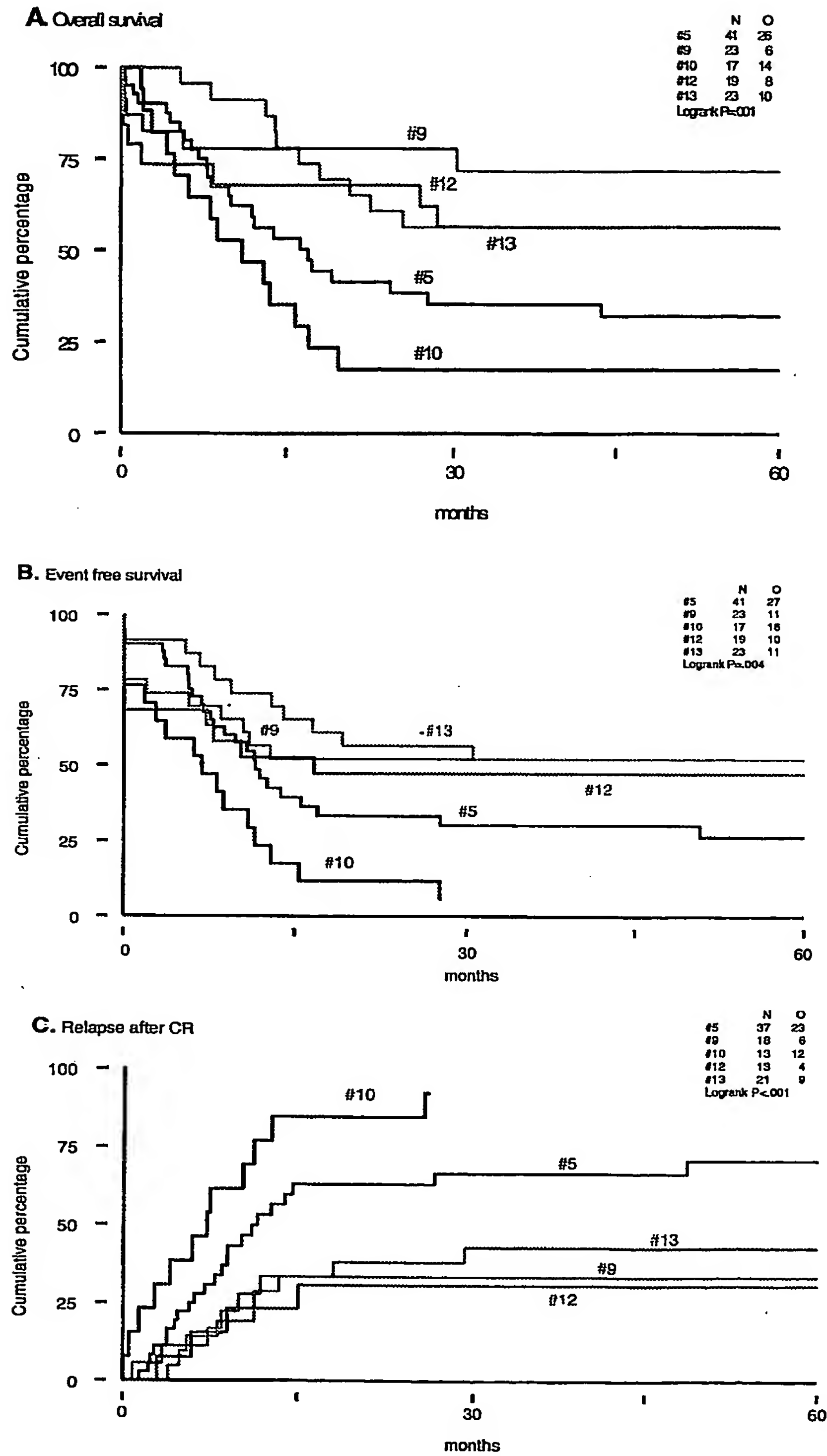


Figure 2

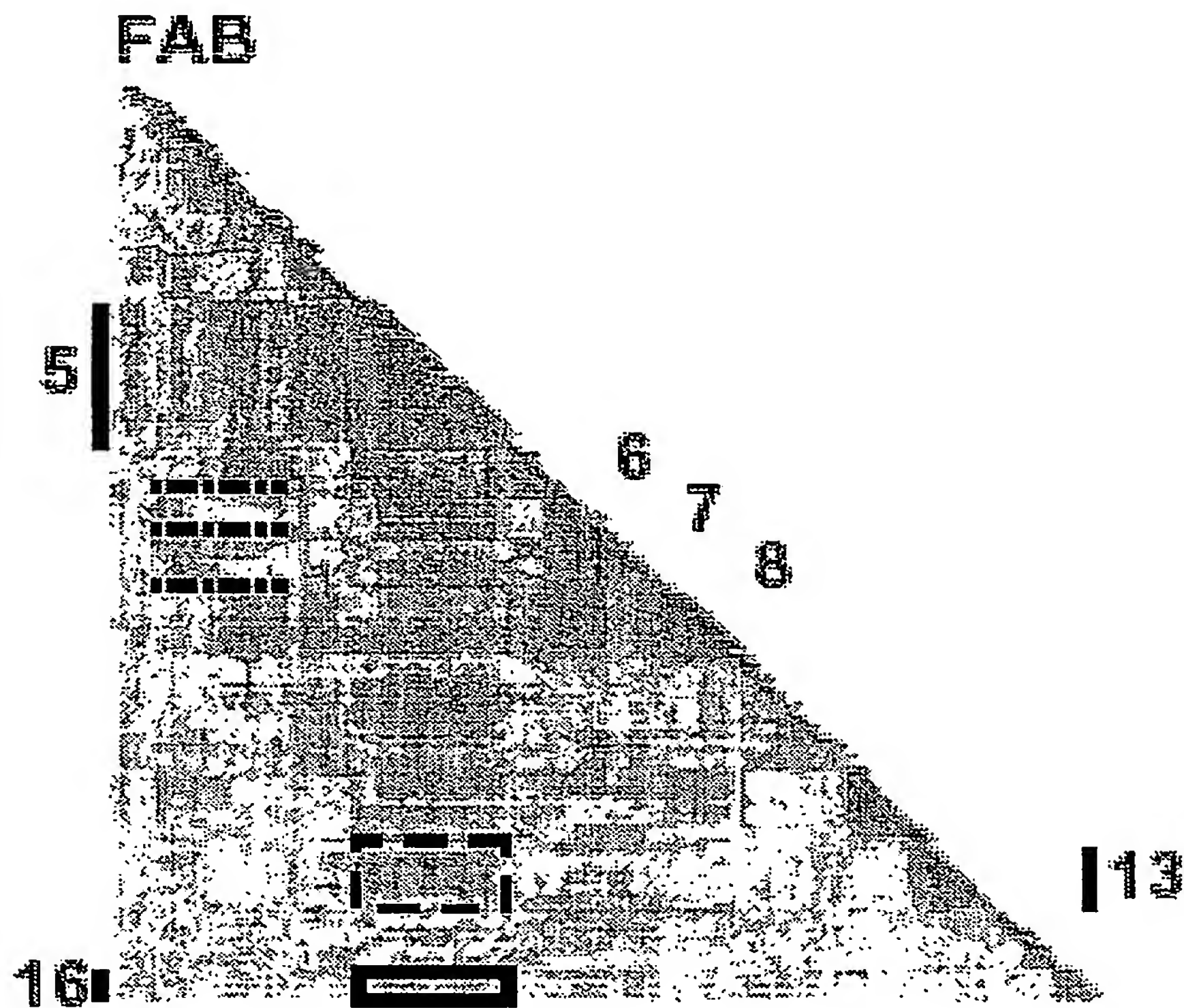


Figure 3

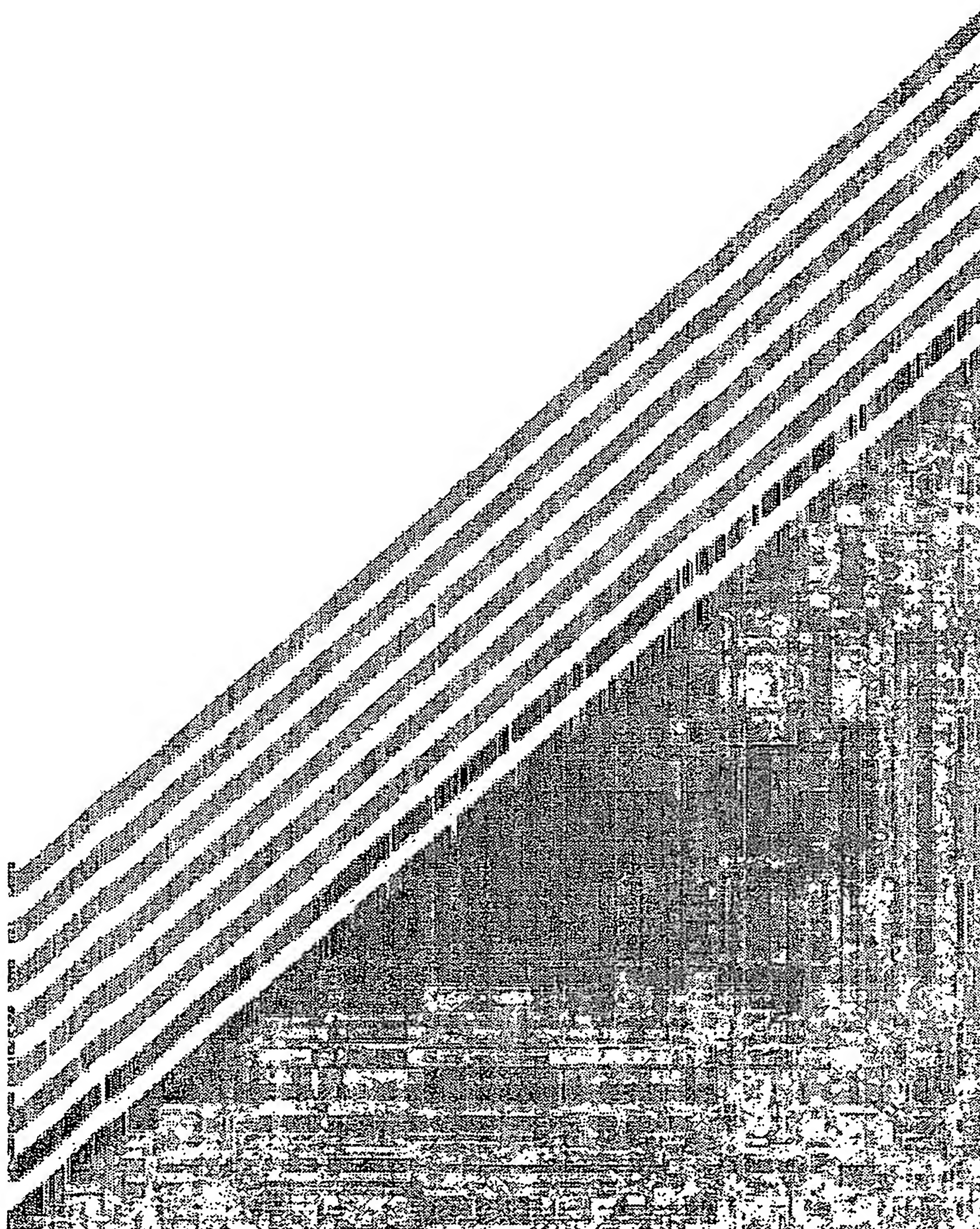


Figure 4

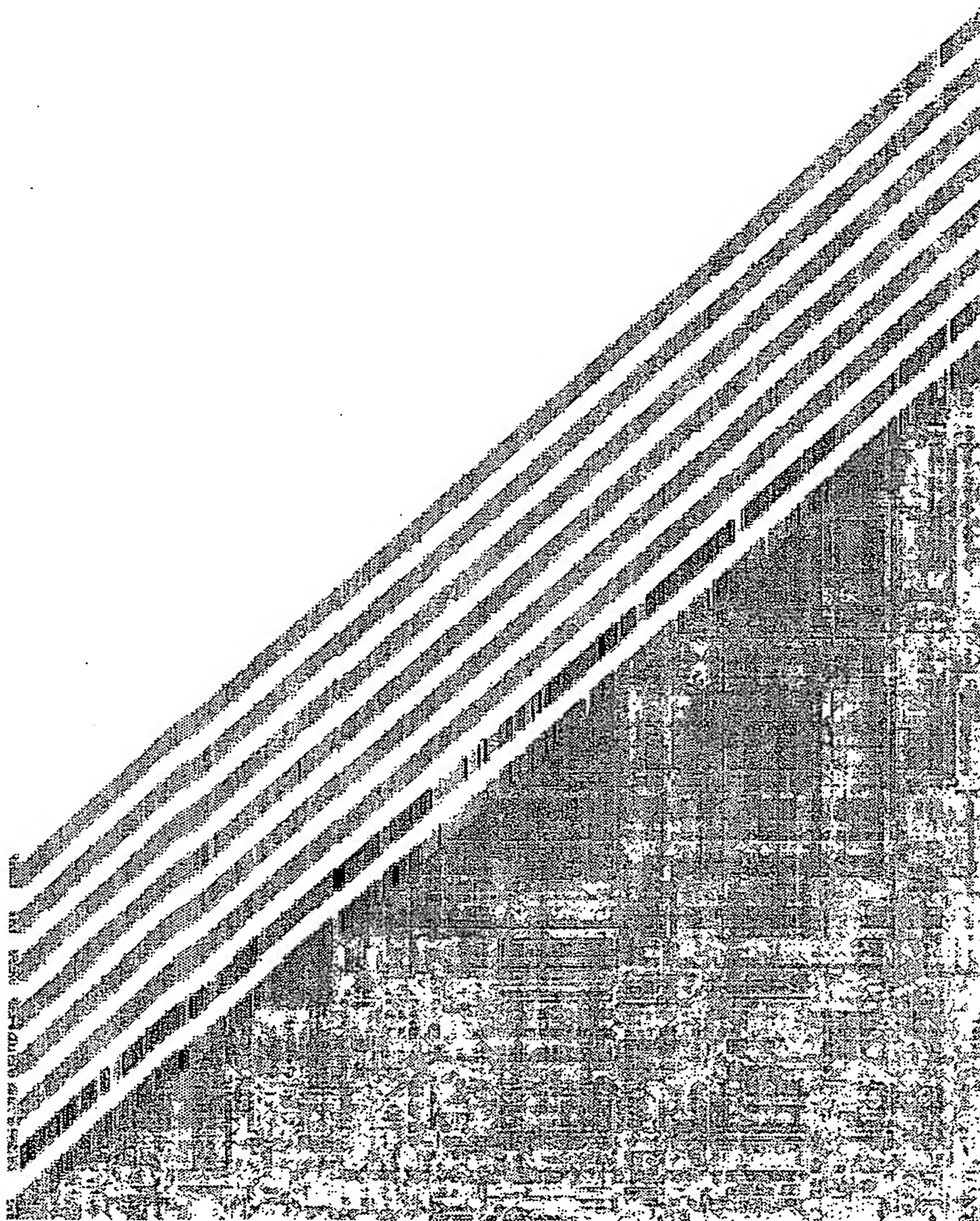


Figure 5

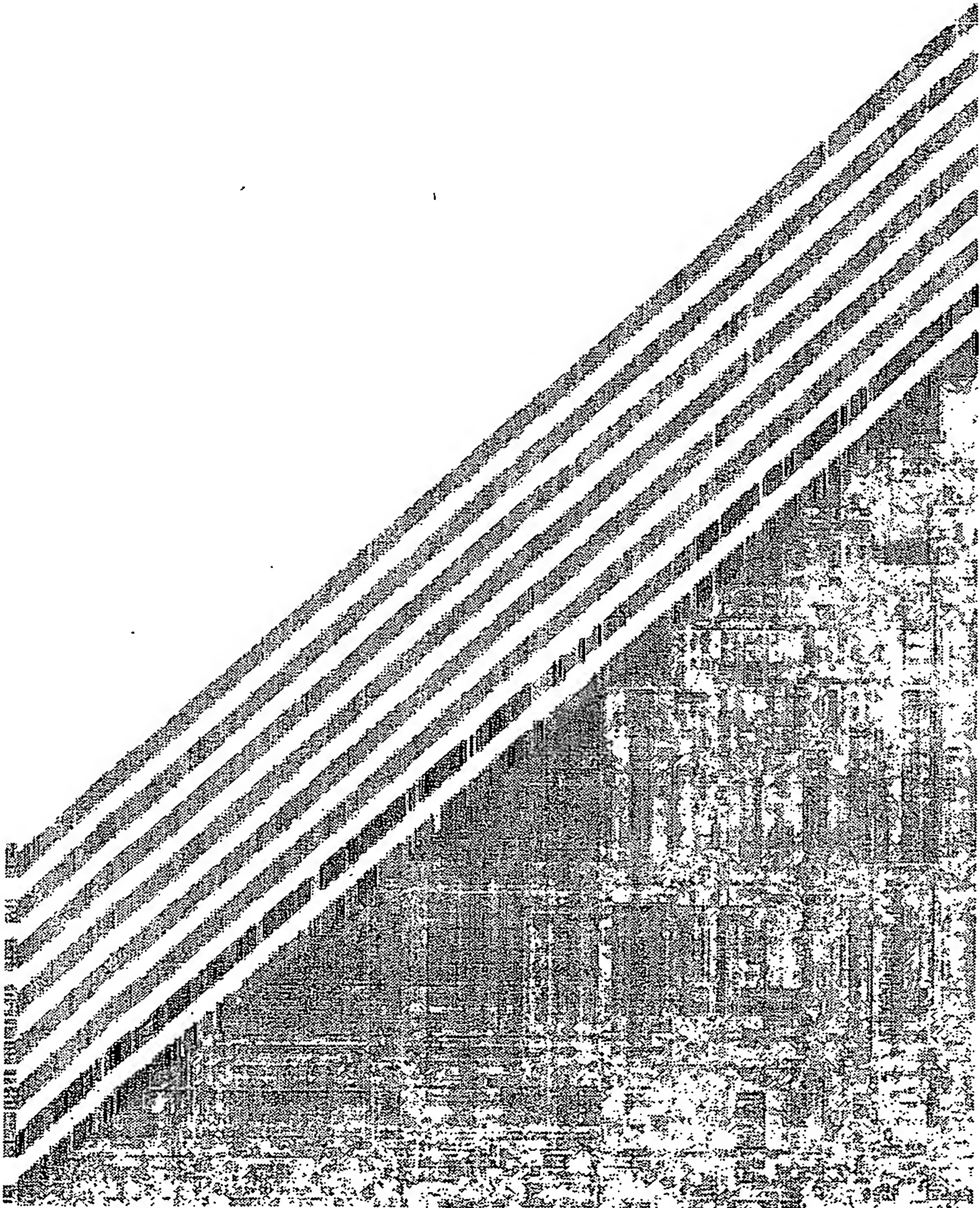


Figure 6

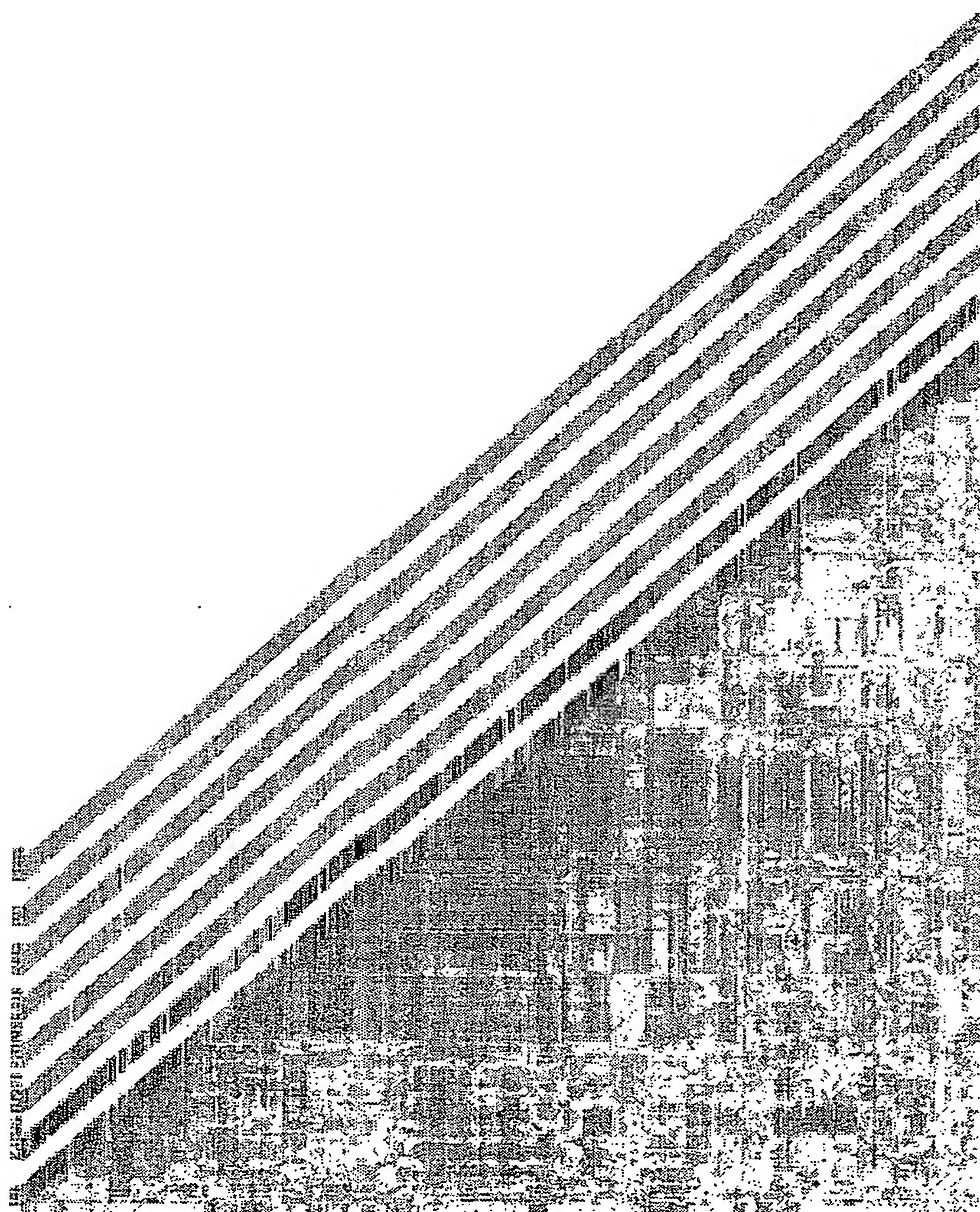


Figure 7

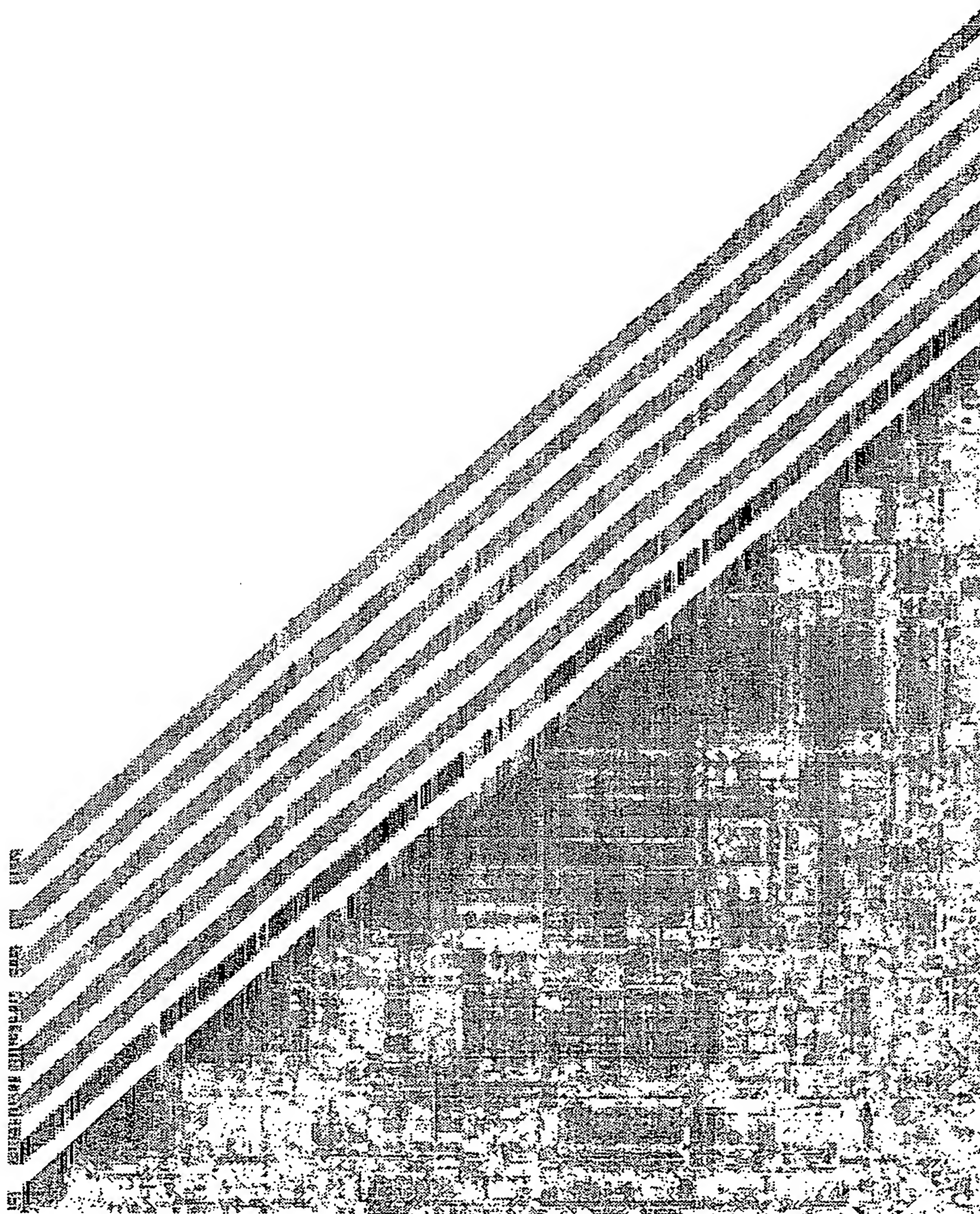


Figure 8

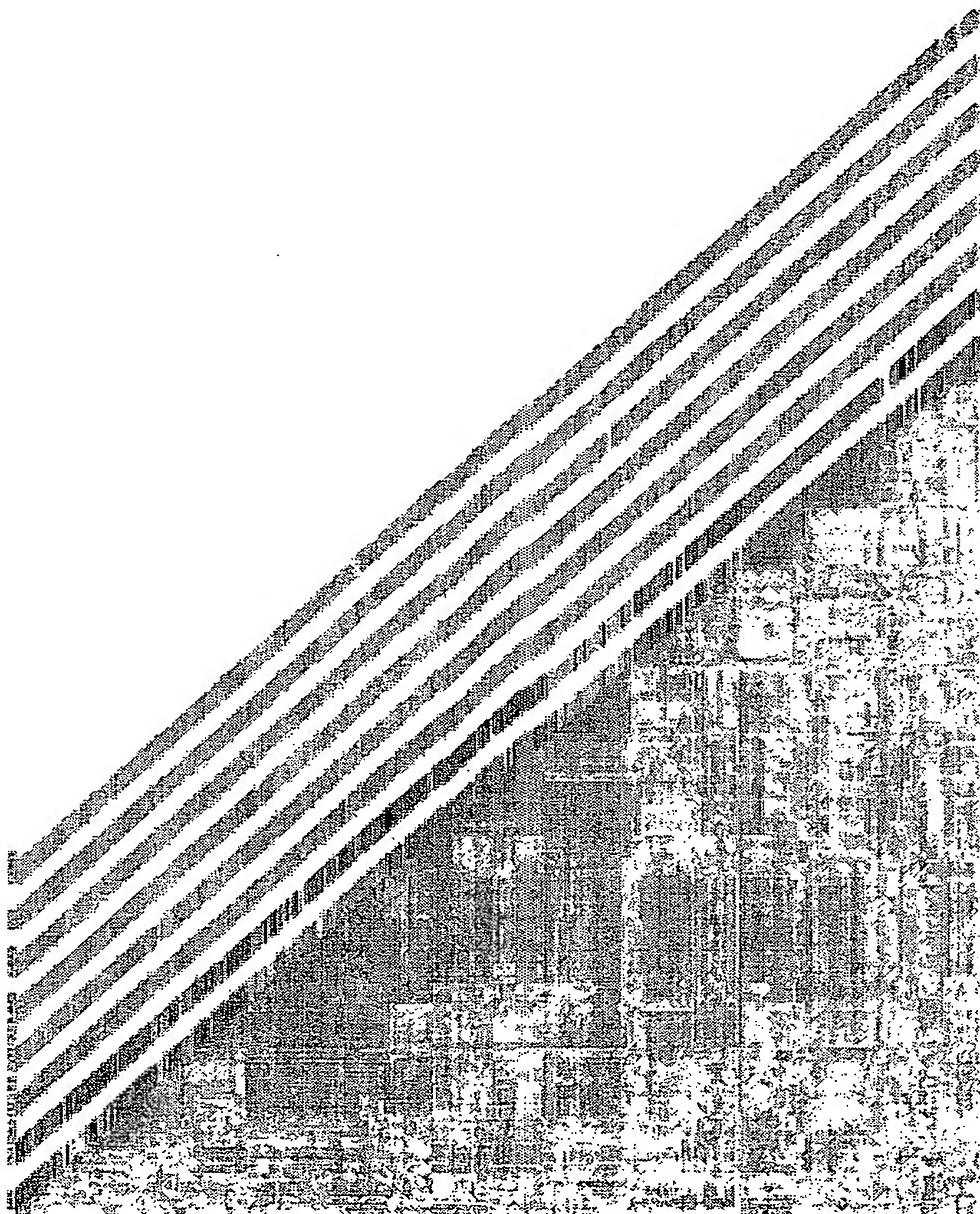


Figure 9

10/27

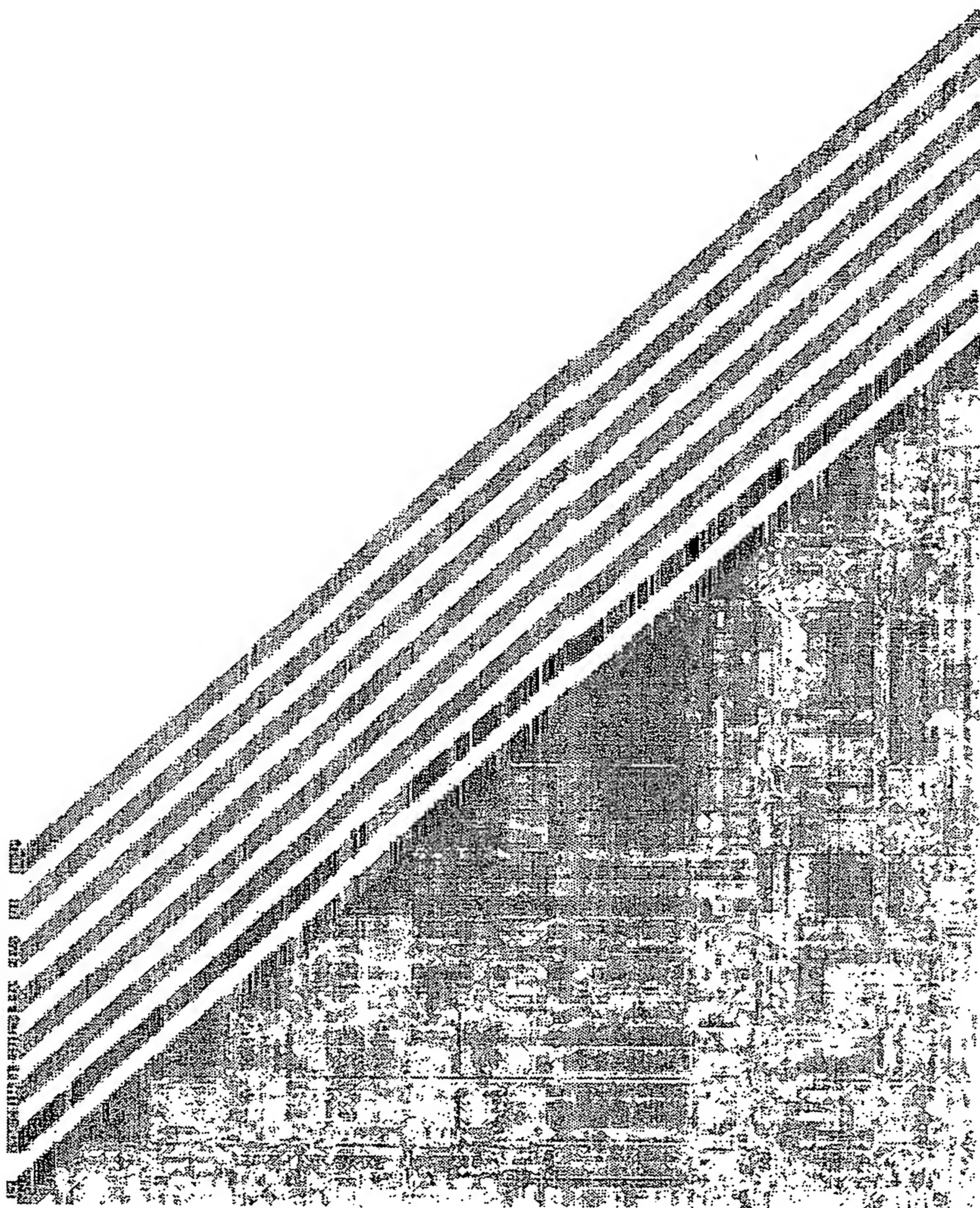


Figure 10

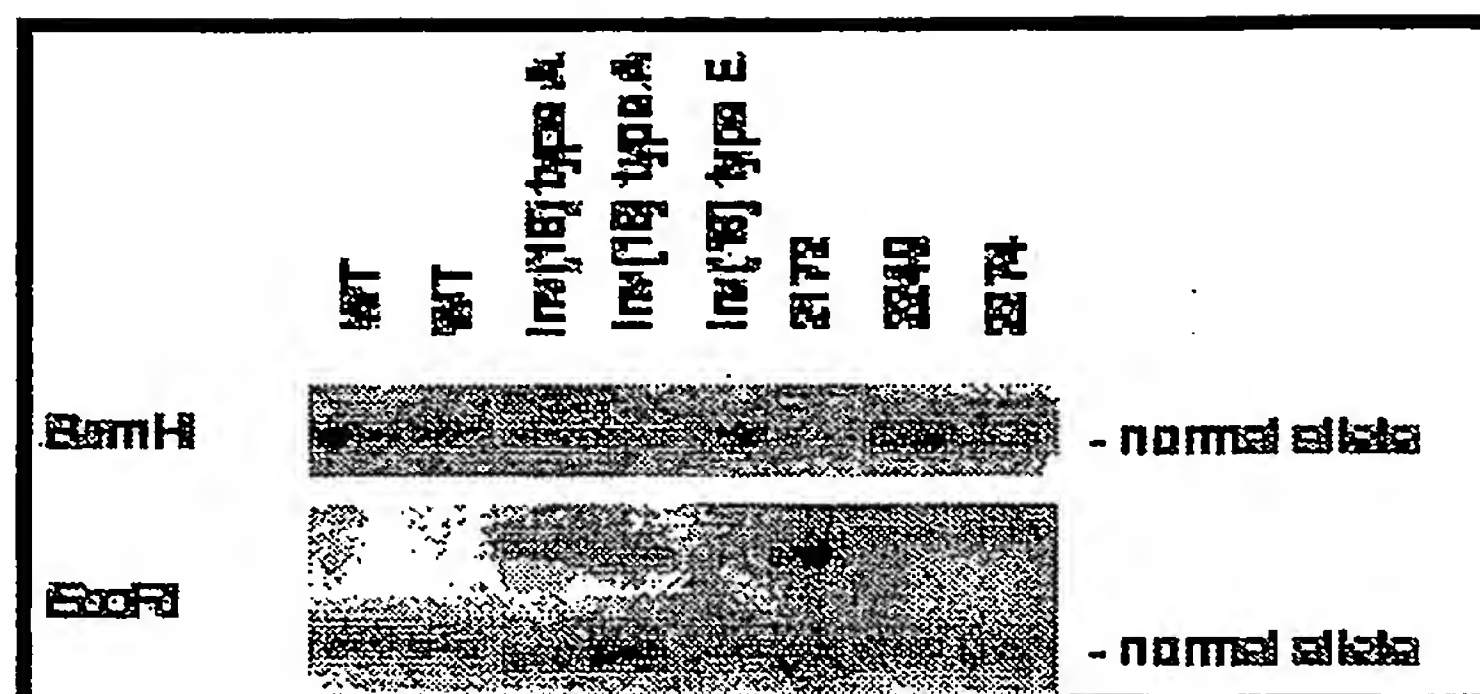


Figure 11

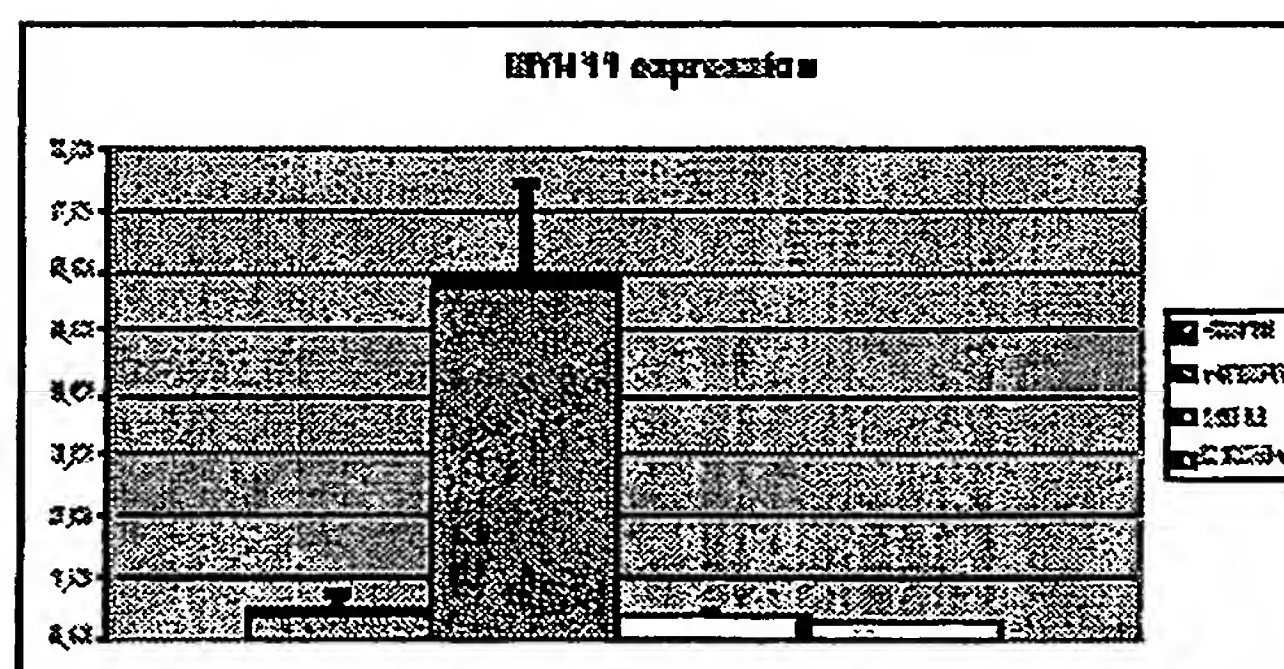


Figure 12

12/27

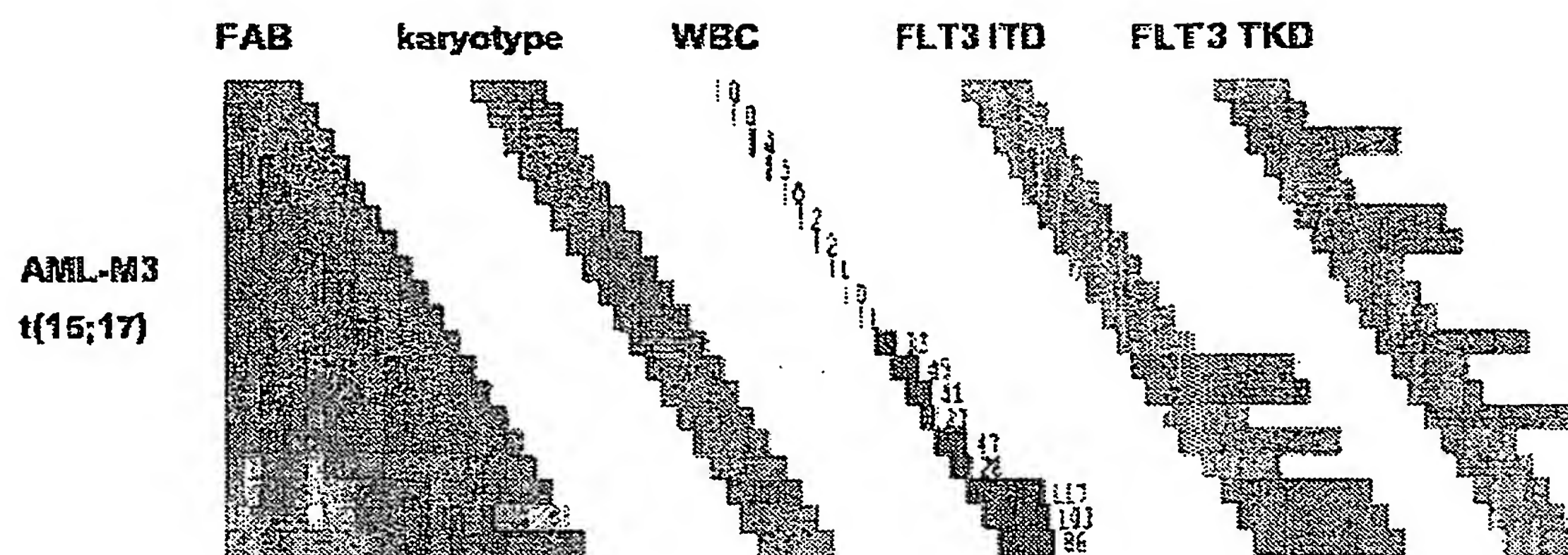


Figure 13

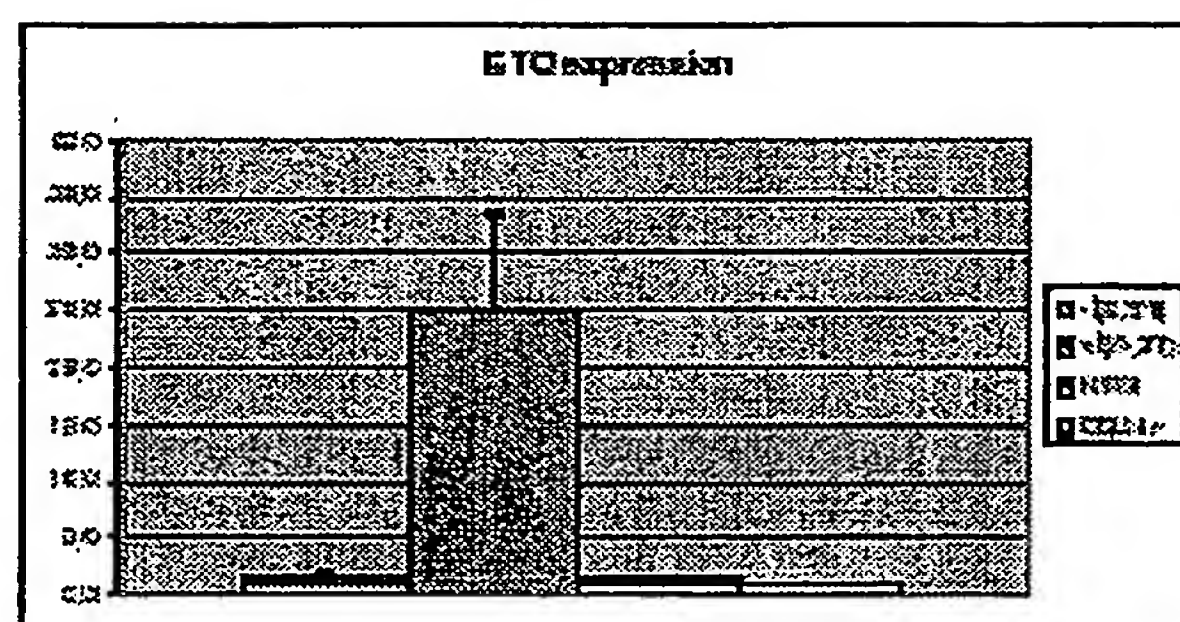


Figure 14


```

#!/usr/bin/perl
use strict;
#Correl_Display_1_6_1.pl
#Designed to take the CVS formatted exported file from OmniViz and produce a nice PNG
#image similar to that on the screen in OmniViz
#New in Version 1.1:
#    Inclusion of clinical data!;
use GD;
$|=1;                                #Do not use output buffer - print diag immediately
#####
#Global Variable decision area:
my %Config;                           #Main Configuration hash.
my $Top_Color=0;
my $Block_Size                        = 10;  #The size (in Pixels) of each block.
#File names: Hard Wired in version 1_1!
my $Clinical_Data_File                = ". /Klinisch_data_AML.csv"; #The name of the Clinical
Datafile (Comma delimited format).
my $Output_File                      = "Output.png";                #Name of the
final generated image.

#Other parameters:
my $Block_Lines                      = "F"; #Whether to draw lines round the (inside) of
the blocks

#NB: Reduces colored area by 1 pixel in both
dimensions
my $Draw_Key_F                      = "T"; #Should a Key be prepared?
my $Color_Strips                    = 40;  #The number of intervening colors in the 'Strip'
my $Minimum                        = -1;  #Assumed minmum of correlation data
my $Maximum                        = +1;  #Assumed minmum of correlation data
my $Scale                          = 5;   #The multiplication factor for relative to $Block_Size
of the Blocks in the Color Stripe

#####
Load_Configuration ();                #Load configuration from STDIN

#####File acceptance testing#####
$Config{Correlation_File} = shift @ARGV; #Pull filename from ARGV
$Config{Output_File} = shift @ARGV;
if (($Config{Correlation_File} eq "") or !(-e $Config{Correlation_File})) #Check file
exists (and is not blank!)
{die "Please enter valid Correlation file name: \n",$Config{Correlation_File}," "
Appears to be invalid\n";}
if ($Config{Output_File} eq "")
{warn "Output filename not specified: defaulting to 'Output.png' (all previous files
of same name will be over written) Hit !!!Ctrl-C!!! NOW to avoid\n";}

open IP_FILE, $Config{Correlation_File} or #Open input file or exit with error
die "Cannot open '$Config{Correlation_File}', '\n for some reason\n";

#####Declare useful variables#####
my @IDS; #Global - for when we find them.
my $Row=0; #Need this for later when loading data.
my $Max_Col=-1; #Used more as a security check than actually in processing.
my @Matrix; #Main Matrix loaded.
my %Patient_ID; #Hash array to store the patient IDs: Used to linke the CC &
Clinical data
#####Load data from Correlation Matrix file#####
while (<IP_FILE>)
{
    chomp (); #Remove end of line char
    $_ =~ s/[\n\r]//g;
    if ($_ eq "") {next;} #In case there are any blank lines
    unless (/\\,/) {die "Errr. There is a distinct lack of commas on this line...of the
Correlation_File: '$Config{Correlation_File}', '\n', substr ($_,0,20), '....'\n";}
    my @Fields = split (",",$_); #Split on Commas (it is a Comma delimited file);
    if (/^Variables/) #Ie. The first line with the "names" of the
rows/columns.
    {
        shift @Fields; #Strip the 'Variables' part off.
    }
}

```

Figure 15a

14/27

```

#           print "@Fields\n";
#           @IDs = @Fields;           #Take of copy of the '@Fields' Array which is locally
scoped
           next;           #Skip to next line
           }
my $Patient_ID = shift @Fields; #Strip the 'Patient' part off the front of each
line.
#           print "D: Loading CC data for patient ID: '$Patient_ID'\n";
           $Patient_ID{$Row} = $Patient_ID;
           if ($Patient_ID =~ m/b$/)
           {
               print "D: Detected 'b' suffix Patient: '$Patient_ID' Corrected to:";
               $Patient_ID =~ s/b$//;
               print " '$Patient_ID'\n";
           }
           if ($#Fields != $Max_Col)           #Check consistent number of Coloums reported
           {
               if ($Max_Col == -1)
               {
                   $Max_Col = $#Fields;           #Wasteful to do this every time..
                   print "D: Setting Max_Col to: '$Max_Col'\n";
               }
               else
               {
                   print "D: Warning: Number of Coloums Deviation: Row '$Row' (has
'$#Fields' coloums, previous ones had '$Max_Col'\n";
               }
           }

           foreach my $C_Col (0..$#Fields)
           {
               $Matrix[$Row][$C_Col] = $Fields[$C_Col];
           }
           $Row++;
       }

print "D: Matrix is: [Rows x Coloums]: $Row x $Max_Col\n";
print "D: Or to put it another way: ", $Matrix, " x ", ${$Matrix[0]}, "\n";
print "D: Matrix Test cell = 0,0 = $Matrix[0][0]\n D: Matrix Test cell 1,0 = $Matrix[1][0]
D: Matrix Test cell 303,303 = $Matrix[302][302]\n";
print "D: We are using clinical data file: '$Config{Clinical_Data_File}'\n";
open CLIN_FILE, $Config{Clinical_Data_File} or
die "Cannot open clinical datafile: '$Config{Clinical_Data_File}', for some
reason\n";
my $Clinical_Data_Col_Header_Text_1;
my $Clinical_Data_Col_Header_Text_2;
my $Clinical_Data_Col_Header_Text_3;
my $Clinical_Data_Col_Header_Text_4;
my $Clinical_Data_Col_Header_Text_5;
my $Clinical_Data_Col_Header_Text_6;
my $Clinical_Data_Col_Header_Text_7;
my $Clinical_Data_Col_Header_Text_8;
my $Clinical_Data_Col_Header_Text_9;
my $Wanted_Header_Col_Index_1;
my $Wanted_Header_Col_Index_2;
my $Wanted_Header_Col_Index_3;
my $Wanted_Header_Col_Index_4;
my $Wanted_Header_Col_Index_5;
my $Wanted_Header_Col_Index_6;
my $Wanted_Header_Col_Index_7;
my $Wanted_Header_Col_Index_8;
my $Wanted_Header_Col_Index_9;
my %Classification_1;
my %Classification_2;
my %Classification_3;
my %Classification_4;
my %Classification_5;
my %Classification_6;
my %Classification_7;
my %Classification_8;

```

Figure 15b

15/27

```

my $Classification_9;
while (<CLIN_FILE>)
{
    chomp ();          #Death to New Line characters! (-)
    unless (/\\,/) {die "Error. There is a distinct lack of commas on this line...of the
Correlation_File: '", $Config{Correlation_File}, "':\n", substr ($_, 0, 20), "....'\n";}
    my @Fields = split ("", $_);
    if (/^Volgnummer/)    #Match the Header line:
    {
        print "D: '$_'\n";
        @Clinical_Data_Col_Headers = @Fields;          #i.e. just copy the comma-split
# line
#Run through all column headers to find the index of the one we are looking for:
        foreach my $C_Column (0..scalar (@Fields))
        {
            if ($Fields[$C_Column] eq $Config{Header_Col_1})    #Scan across the
header line for column we want #1
            {
                #Whoppie! Found the one we want!
                $Wanted_Header_Col_Index_1 = $C_Column;
                $Clinical_Data_Col_Header_Text_1 = $Config{Header_Col_1};
                #Only now will we add it.
                print "D: Found the Coloumn [1] in the header we are looking
for!: Index is: '$Wanted_Header_Col_Index_1'\n";
                next;    #There is (we assume) only one unique coloumn name...
            }
            if ($Fields[$C_Column] eq $Config{Header_Col_2})    #Scan across the
header line for column we want #2
            {
                #Whoppie! Found the one we want!
                $Wanted_Header_Col_Index_2 = $C_Column;
                $Clinical_Data_Col_Header_Text_2 = $Config{Header_Col_2};
                #Only now will we add it.
                print "D: Found the Coloumn [2] in the header we are looking
for!: Index is: '$Wanted_Header_Col_Index_2'\n";
                $Clinical_Data_Col_Header_Text_2 =~ s/,/\/.\/g;    #Sometimes
being Dutch is cute, othertimes its just plain annoying...Ja?
                next;    #There is (we assume) only one unique coloumn name...
            }
            if ($Fields[$C_Column] eq $Config{Header_Col_3})    #Scan across the
header line for column we want #1
            {
                #Whoppie! Found the one we want!
                $Wanted_Header_Col_Index_3 = $C_Column;
                $Clinical_Data_Col_Header_Text_3 = $Config{Header_Col_3};
                #Only now will we add it.
                print "D: Found the Coloumn [3] in the header we are looking
for!: Index is: '$Wanted_Header_Col_Index_3'\n";
                next;    #There is (we assume) only one unique coloumn name...
            }
            if ($Fields[$C_Column] eq $Config{Header_Col_4})    #Scan across the
header line for column we want #1
            {
                #Whoppie! Found the one we want!
                $Wanted_Header_Col_Index_4 = $C_Column;
                $Clinical_Data_Col_Header_Text_4 = $Config{Header_Col_4};
                #Only now will we add it.
                print "D: Found the Coloumn [4] in the header we are looking
for!: Index is: '$Wanted_Header_Col_Index_4'\n";
                next;    #There is (we assume) only one unique coloumn name...
            }
            if ($Fields[$C_Column] eq $Config{Header_Col_5})    #Scan across the
header line for column we want #1
            {
                #Whoppie! Found the one we want!
                $Wanted_Header_Col_Index_5 = $C_Column;
                $Clinical_Data_Col_Header_Text_5 = $Config{Header_Col_5};
                #Only now will we add it.
                print "D: Found the Coloumn [5] in the header we are looking
for!: Index is: '$Wanted_Header_Col_Index_5'\n";
                next;    #There is (we assume) only one unique coloumn name...
            }
            if ($Fields[$C_Column] eq $Config{Header_Col_6})    #Scan across the
header line for column we want #1
            {
                #Whoppie! Found the one we want!
                $Wanted_Header_Col_Index_6 = $C_Column;

```

Figure 15c

16/27

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        $Clinical_Data_Col_Header_Text_6 = $Config{Header_Col_6};
        #Only now will we add it.
        print "D: Found the Coloumn [6] in the header we are looking
for!: Index is: '$Wanted_Header_Col_Index_6'\n";
        next; #There is (we assume) only one unique coloumn name...
    }
    if ($Fields[$C_Column] eq $Config{Header_Col_7}) #Scan across the
header line for column we want #7
    {
        #Whoppie! Found the one we want!
        $Wanted_Header_Col_Index_7 = $C_Column;
        $Clinical_Data_Col_Header_Text_7 = $Config{Header_Col_7};
        #Only now will we add it.
        print "D: Found the Coloumn [7] in the header we are looking
for!: Index is: '$Wanted_Header_Col_Index_7'\n";
        next; #There is (we assume) only one unique coloumn name...
    }
    if ($Fields[$C_Column] eq $Config{Header_Col_8}) #Scan across the
header line for column we want #7
    {
        #Whoppie! Found the one we want!
        $Wanted_Header_Col_Index_8 = $C_Column;
        $Clinical_Data_Col_Header_Text_8 = $Config{Header_Col_8};
        #Only now will we add it.
        print "D: Found the Coloumn [8] in the header we are looking
for!: Index is: '$Wanted_Header_Col_Index_8'\n";
        next; #There is (we assume) only one unique coloumn name...
    }
    if ($Fields[$C_Column] eq $Config{Header_Col_9}) #Scan across the
header line for column we want #7
    {
        #Whoppie! Found the one we want!
        $Wanted_Header_Col_Index_9 = $C_Column;
        $Clinical_Data_Col_Header_Text_9 = $Config{Header_Col_9};
        #Only now will we add it.
        print "D: Found the Coloumn [9] in the header we are looking
for!: Index is: '$Wanted_Header_Col_Index_9'\n";
        next; #There is (we assume) only one unique coloumn name...
    }
}

if ($Clinical_Data_Col_Header_Text_1 eq "") #I.e., nothing was set...
{
    die "Opps.\nI was looking for the column header:
'", $Config{Header_Col_1}, "' in the clinical data file: '$Config{Clinical_Data_File}', '\nI
didn't find it!\nWhat I did find was: '", join(";", @Fields), "' if that helps...\n";
}
if ($Clinical_Data_Col_Header_Text_2 eq "") #I.e., nothing was set...
{
    die "Opps.\nI was looking for the column header:
'", $Config{Header_Col_2}, "' in the clinical data file: '$Config{Clinical_Data_File}', '\nI
didn't find it!\nWhat I did find was: '", join(";", @Fields), "' if that helps...\n";
}
if ($Clinical_Data_Col_Header_Text_3 eq "") #I.e., nothing was set...
{
    die "Opps.\nI was looking for the column header:
'", $Config{Header_Col_3}, "' in the clinical data file: '$Config{Clinical_Data_File}', '\nI
didn't find it!\nWhat I did find was: '", join(";", @Fields), "' if that helps...\n";
}
if ($Clinical_Data_Col_Header_Text_5 eq "") #I.e., nothing was set...
{
    die "Opps.\nI was looking for the column header:
'", $Config{Header_Col_5}, "' in the clinical data file: '$Config{Clinical_Data_File}', '\nI
didn't find it!\nWhat I did find was: '", join(";", @Fields), "' if that helps...\n";
}

if ($Clinical_Data_Col_Header_Text_7 eq "") #I.e., nothing was set...
{
    die "Opps.\nI was looking for the column header:
'", $Config{Header_Col_7}, "' in the clinical data file: '$Config{Clinical_Data_File}', '\nI
didn't find it!\nWhat I did find was: '", join(";", @Fields), "' if that helps...\n";
}

if ($Clinical_Data_Col_Header_Text_8 eq "") #I.e., nothing was set...
{
    die "Opps.\nI was looking for the column header:
'", $Config{Header_Col_8}, "' in the clinical data file: '$Config{Clinical_Data_File}', '\nI
didn't find it!\nWhat I did find was: '", join(";", @Fields), "' if that helps...\n";
}

if ($Clinical_Data_Col_Header_Text_9 eq "") #I.e., nothing was set...
{
    die "Opps.\nI was looking for the column header:
'", $Config{Header_Col_9}, "' in the clinical data file: '$Config{Clinical_Data_File}', '\nI
didn't find it!\nWhat I did find was: '", join(";", @Fields), "' if that helps...\n";
}

```

Figure 15d


```

        next;          #We have found the Coloumn that we are looking for...so skip
to next line.
    }
#    print "D: Loading Clinical Classification for Patient: '$Fields[0]' this
is: '$Fields[$Wanted_Header_Col_Index_1]' & '$Fields[$Wanted_Header_Col_Index_2]' &
'$Fields[$Wanted_Header_Col_Index_3]' & '$Fields[$Wanted_Header_Col_Index_4]' &
'$Fields[$Wanted_Header_Col_Index_5]'\n";          #The first field contains the header
Patient ID...
#    if (exists $Classification{$Fields[$Wanted_Header_Col_Index]})
#    {
#        #We already have one of these!
#        die "Error! Patient IDs are not unique!\nThis one
'", $Classification{$Fields[$Wanted_Header_Col_Index]}, "' found for the 2nd time!";
    }
    $Classification_1{$Fields[0]} = $Fields[$Wanted_Header_Col_Index_1];
    $Classification_2{$Fields[0]} = $Fields[$Wanted_Header_Col_Index_2];
    $Classification_3{$Fields[0]} = $Fields[$Wanted_Header_Col_Index_3];
    $Classification_4{$Fields[0]} = $Fields[$Wanted_Header_Col_Index_4];
    $Classification_5{$Fields[0]} = $Fields[$Wanted_Header_Col_Index_5];
    $Classification_6{$Fields[0]} = $Fields[$Wanted_Header_Col_Index_6];
    $Classification_7{$Fields[0]} = $Fields[$Wanted_Header_Col_Index_7];
    $Classification_8{$Fields[0]} = $Fields[$Wanted_Header_Col_Index_8];
    $Classification_9{$Fields[0]} = $Fields[$Wanted_Header_Col_Index_9];
#    push @Classification, $Fields[$Wanted_Header_Col_Index];    #We know which column we
want: so just add this one...
}
#####Prepare colors#####
$image -> filledRectangle ($x1, $y1, $x2+20*$Catergory+$Config{Block_Size} , $y2,
$Block_color);
#This last expression is so that all the bars will fit on! The 800 is a guess!
my $Width = $Config{Block_Size} * $Row + ($Config{Block_Size} + $Config{Graph_Space} * 8);
my $Height = $Config{Block_Size} * $Max_Col;
#Create Image canvases & Allocate basic colors to them:

my $Image = new GD::Image ($Width , $Height);          #Create main image 'Canvas'
my $White = $Image -> colorAllocate (255,255,255); #Set first color (also background
color!)
Top_Color_Print();
#my $Blue = $Image -> colorAllocate (0,0,255);          #Allocate color 'Blue';
#my $Red = $Image -> colorAllocate (255,0,0);          #Allocate color 'Red';
my $Black= $Image -> colorAllocate (0,0,0);          #Allocate color 'Black';
Top_Color_Print();
my $Col_Stripe_Width = $Config{Block_Size} * $Config{Scale} * ($Config{Color_Strips}+1);
my $Col_Stripe_Height = $Config{Block_Size} * $Config{Scale} ;
print "D: Color Stripe will be ($Col_Stripe_Width x $Col_Stripe_Height)\n";
my $Color_Stripe_IMG = new GD::Image ($Col_Stripe_Width, $Col_Stripe_Height);
$Color_Stripe_IMG -> colorAllocate (255,0,255);    #Set first color (also background
color!)

my $Title_Bar = new GD::Image ($Width , 100);
$Title_Bar -> colorAllocate (255,255,255); #Set first color (also background color!)
#my $Blue = $Image -> colorAllocate (0,0,255);          #Allocate color 'Blue';
#my $Red = $Image -> colorAllocate (255,0,0);          #Allocate color 'Red';
$Title_Bar -> colorAllocate (0,0,0);          #Allocate color 'Black';

my $Patient_IDs = new GD::Image (400, $Height);
$Patient_IDs -> colorAllocate (255,255,255); #Set first color (also background color!)
#my $Blue = $Image -> colorAllocate (0,0,255);          #Allocate color 'Blue';
#my $Red = $Image -> colorAllocate (255,0,0);          #Allocate color 'Red';
$Patient_IDs -> colorAllocate (0,0,0);          #Allocate color 'Black';

#my $Image = new GD::Image (1000,100);          #HW: For testing Color Stripe...
my @Color_Stripe;
#Colors run: Full Blue - Partial Blues - Full White - Partial Reds - Full Red
print "D: Allocate 'Blues': \n";
foreach my $C_Color (0..($Config{Color_Strips}/2-1))    #Run: Full Blue to one level
below white
{
    printf ("%3i ", $C_Color);

```

Figure 15e

18/27

```

    my $Blue_level = 255/($Config{Color_Strips}/2)*$C_Color;    #The (complex)
calculation for the color level
    print "D: Allocating Color: Blue_level = '$Blue_level'\n";    #works for the
red as well but without the "255-" part
    push @Color_Stripe, $Image -> colorAllocate ($Blue_level,$Blue_level,255);
#    $Color_Stripe_IMG -> colorAllocate (255,$Blue_level,$Blue_level);

    Top_Color_Print();
}
#print "D: $#Color_Stripe, @Color_Stripe\n";    #Note down
the index of the color just allocated in a 'look-up' table
#print "D: Allocating White: < As mid point >";
push @Color_Stripe, $Image -> colorAllocate (255,255,255); #The 'White' is fixed.
# $Color_Stripe_IMG -> colorAllocate (255,255,255);
#Top_Color_Print();
#print "D: $#Color_Stripe, @Color_Stripe\n";
print "\nD: Allocate 'Reds': \n";
foreach my $C_Color (1..($Config{Color_Strips}/2)) #Run: one above 'white' to full red
{
    printf ("%3i ",$C_Color);
    my $Red_level = 255 - 255/($Config{Color_Strips}/2)*$C_Color;
    print "D: Red_level = '$Red_level'\n";
    push @Color_Stripe, $Image -> colorAllocate (255,$Red_level,$Red_level);
#    $Color_Stripe_IMG -> colorAllocate (255,$Red_level,$Red_level);
#    Top_Color_Print();
}
print "\n";
#print "D: $#Color_Stripe, @Color_Stripe\n";
print "D: Strip Colors = '@Color_Stripe'\n";

#####Build array image#####
#Build array
my $Range=sqrt ( ($Config{Maximum} - $Config{Minimum}) ** 2);    #Ok, so we know that for
Pearson CC it will be 2
my $BINS = $#Color_Stripe +1;
my $Bin_width= $Range / $BINS;
print "D: Possible BINS = '$BINS';    For Range = '$Range', so each bin is: '$Bin_width'
wide\n";
print "D: Building Array:\n";
print "D:    ";
foreach my $row (0..$#Matrix)    #Cycle through all rows
{
    foreach my $col (0..$Max_Col)    #Cycle through all coloumsn
    {
        if ($row== $col)    {last;}
        my ($x1,$x2,$y1,$y2,$color);    #Declare Intermediate variables
        my $value = $Matrix [$row][$col] - $Config{Minimum};    #Re-center the
data scale to +ve
#        print "D: value = '$value'    ";
#Calculate the color required using the same indices as lodged @Color_Stripe (NB:
Color_Stripe need not exist by this stage: OPTIMISES AWAY?)
        $color = int ($value / $Bin_width) +1 +1;    #The extra '+1' is becaa
#        print "\nD: Matrix Color = $color, \n";
#        $bin = int ($value 1) * (1/ $Color_Strips +1);
#        print "D: Bin = ' $color '\n";
        if ( $color >= $BINS) {$color = $BINS;}
        $x1 = $Config{Block_Size} * $col; $x2 = $x1 + $Config{Block_Size}-1;
#Top left to Bottom right of a square
        $y1 = $Config{Block_Size} * $row; $y2 = $y1 + $Config{Block_Size}-1;
#        die "HIT BLOCK";
#        print "D: x1 = $x1, x2 = $x2 ; y1 = $y1 ; y2 = $y2\n";
        if ($Patient_ID{$row} eq $Config{Marked_Patient})#        print "D: value =
'$value'\n";
            {$color=$Black;}
            $Image -> filledRectangle ($x1,$y1,$x2, $y2, $color);    #Actually draw
the square at the correct location
#            $Image -> rectangle ($x1,$y1,$x2-1, $y2-1, $Black); #Outline the square
            }
    }
    printf ("%5i ",$row);    #Just a counter printed to the screen / stream.
#    die "HIT BLOCK\n";
}

```

Figure 15f


```

print "\n";
if ($Config{Block_Lines} eq "T")      #Did the user request lines?
{
    Draw_Lines_on_Image ();
}

my $Classes; my $Class_Lowest_Color;

if ($Config{Mark_Patient_Data} eq "Y")
{
    ($Class_Lowest_Color, $Classes) = Mark_Patient_Data ();
}
print "D: Classes Returned = '$Classes'; number of colors needed:
'", $Class_Lowest_Color, "'\n";

#my $Classification_Stripe_IMG = new GD::Image ($Config{Block_Size} * $Classes *
$Config{Scale}, $Config{Block_Size} * $Config{Scale});
##### Invoke Draw_Key () if necessary
if ($Config {Draw_Color_Stripe} eq "T")
{
    Draw_Color_Stripe ();
}

#Combine the images and write them out:
my $Parent_Image = new GD::Image ($Width + 100, $Height + 200);      #Create final
image 'Canvas' into which others are merged
my $White = $Parent_Image -> colorAllocate (255,255,255);      #Set first color (also
background color!)
my $Black = $Parent_Image -> colorAllocate (0,0,0);      #Formally allocate color
'Black'
my $Patient_ID_Width = 250;
$Parent_Image -> copy ($Image, $Patient_ID_Width, 100, 0, 0, $Width, $Height);      #Merge the
main heat-map / Patient Data.
$Parent_Image -> copy ($Patient_IDs, 0, 100, 0, 0, $Patient_ID_Width, $Height);      #Merge the
Patient IDs
$Parent_Image -> copy ($Color_Stripe_IMG, ($Width - $Col_Stripe_Width)/2 +
$Patient_ID_Width, $Height + 100 + 100 - $Col_Stripe_Height, 0, 0, $Col_Stripe_Width,
$Col_Stripe_Height+1);
$Parent_Image -> stringTTF ($Black, "./fonts/arial.ttf", 30, 0,
($Width - $Col_Stripe_Width)/2 + $Patient_ID_Width - 40,
$Height + 100 + 40 + ($Config{Block_Size} * $Config{Scale}) /2,
"-1");

$Parent_Image -> stringTTF ($Black, "./fonts/arial.ttf", 30, 0,
$Width / 2 + 100 - 10,
$Height + 100 + 40 + ($Config{Block_Size} * $Config{Scale}) /2,
"0");

$Parent_Image -> stringTTF ($Black, "./fonts/arial.ttf", 30, 0,
($Width - $Col_Stripe_Width)/2 + $Patient_ID_Width +
$Col_Stripe_Width ,
$Height + 100 + 40 + ($Config{Block_Size} * $Config{Scale}) /2,
"+1");

my $x1=0;
$Title_Bar -> stringTTF ($Black, "./fonts/arial.ttf", 30, 0,
$x1, 90, "FAB");
$x1 = $x1 + $Config{Graph_Space};
$Title_Bar -> stringTTF ($Black, "./fonts/arial.ttf", 30, 0,
$x1, 90, "WBC");

$x1 = $x1 + $Config{Graph_Space};
$Title_Bar -> stringTTF ($Black, "./fonts/arial.ttf", 30, 0,
$x1, 90, "FLT3 ITD");

$x1 = $x1 + $Config{Graph_Space};
$Title_Bar -> stringTTF ($Black, "./fonts/arial.ttf", 30, 0,
$x1, 90, "OS");

$x1 = $x1 + $Config{Graph_Space};
$Title_Bar -> stringTTF ($Black, "./fonts/arial.ttf", 30, 0,

```

Figure 15g

20/27

```

        $x1, 90, "EFS");

$x1 = $x1 + $Config{Graph_Space};
$title_bar -> stringTTF ($Black, "./fonts/arial.ttf", 30, 0,
        $x1, 90, "EVI1");

$x1 = $x1 + $Config{Graph_Space};
$title_bar -> stringTTF ($Black, "./fonts/arial.ttf", 30, 0,
        $x1, 90, "CEBP mutant");

$parent_image -> copy ($title_bar, $patient_id_width, 0,
        0, 0, $width, 100);
print "Just to remind you: the image created will be : '$Config{Output_File}'," (you can
alter the default by using 2nd command line argument)\n";

$parent_image -> stringTTF ($Black, "./fonts/arial.ttf", 50, 3.142 / 2,
        $width - 100,
        $height,
        "Original Correlation File: '$Config{Correlation_File}'");
$parent_image -> stringTTF ($Black, "./fonts/arial.ttf", 50, 3.142 / 2,
        $width - 40,
        $height,
        "This Image is: '$Config{Output_File}'");

binmode OUTPUT;
open OUTPUT, ">$Config{Output_File}" or die "Cannot open output file: ' ",
$Config{Output_File}, "'\n";
print OUTPUT $parent_image -> png ();          #Thankfully OO! The difficult bit!
close OUTPUT;                                #Will close anyway upon program exit

#
#
#
#
#
#Subroutines only below here....
#
# #####
#####SUB START
sub Draw_Lines_on_Image {

    print "D: Ok, You wanted lines....\n";          #Guess so....
    my $x_max = $Config{Block_Size} * $Max_Col; #Pre-calculate the right-hand edge
    my $y_max = $Config{Block_Size} * $Row;      #Pre-calculate the bottom edge.
    print "D: (Horizontal): ";
    foreach my $row (0..$Row)                    #For all rows
    {
        my $y = $Config{Block_Size} * $row; #Calculate the 'y' position
        $image -> line (0, $y, $x_max, $y, $Black); #Draw Horizontal Line
        printf ("%5i ", $row);
    }
    print "\n";
    print "D: (Vertical): ";
    foreach my $col (0..$Max_Col)                #For all columns
    {
        my $x = $Config{Block_Size} * $col; #Calculate the 'x' position
        $image -> line ($x, 0, $x, $y_max, $Black); #Draw Vertical Line
        printf ("%5i ", $col);
    }
    print "\n";
}

#####SUB START
sub Draw_Color_Stripe {

```

Figure 15h

21/27

```

my $White = $Color_Stripe_IMG -> colorAllocate (255,0,255);      #Set first color (also
background color!)
my $Black = $Color_Stripe_IMG -> colorAllocate (0,0,0);          #Allocate color 'Black';

print "D: Color Stripe image is: '$Col_Stripe_Width x $Col_Stripe_Height'\n";
$Color_Stripe_IMG -> rectangle (1,1, $Col_Stripe_Width -1, $Col_Stripe_Height-1, $Black);
#my $Image = new GD::Image (1000,100);      #HW: For testing Color Stripe...
#my @Color_Stripe;
#Colors run: Full Blue - Partial Blues - Full White - Partial Reds - Full Red
#print "D: Allocate 'Blues': \n";

my @Color_Stripe_Bar;
#Colors run: Full Blue - Partial Blues - Full White - Partial Reds - Full Red
print "D: Allocate 'Blues': \n";
foreach my $C_Color (0..($Config{Color_Strips}/2-1))      #Run: Full Blue to one level
below white
{
    printf ("%3i ", $C_Color);
    my $Blue_level = 255/($Config{Color_Strips}/2)*$C_Color;      #The (complex)
calculation for the color level
    # print "D: Allocating Color: Blue_level = '$Blue_level'\n";      #works for the
red as well but without the "255-" part
    push @Color_Stripe_Bar, $Color_Stripe_IMG -> colorAllocate
($Blue_level, $Blue_level, 255);
}
print "D: Color_Stripe_Bar: ,|@Color_Stripe_Bar| i.e. has: $#Color_Stripe_Bar +1
divisions\n";
#print "D: $#Color_Stripe, @Color_Stripe\n";      #Note down
the index of the color just allocated in a 'look-up' table
#print "D: Allocating White: < As mid point >";
push @Color_Stripe_Bar, $Color_Stripe_IMG -> colorAllocate (255,255,255); #The 'White' is
fixed.
print "D: Color_Stripe_Bar: ,|@Color_Stripe_Bar| i.e. has: $#Color_Stripe_Bar +1
divisions\n";
#print "D: $#Color_Stripe, @Color_Stripe\n";
print "\nD: Allocate 'Reds': \n";
foreach my $C_Color (1..($Config{Color_Strips}/2))      #Run: one above 'white' to full red
{
    printf ("%3i ", $C_Color);
    my $Red_level = 255 - 255/($Config{Color_Strips}/2)*$C_Color;
    # print "D: Red_level = '$Red_level'\n";
    push @Color_Stripe_Bar, $Color_Stripe_IMG -> colorAllocate
(255, $Red_level, $Red_level);
}
print "\n";
print "D: Color_Stripe_Bar: ,|@Color_Stripe_Bar| i.e. has: $#Color_Stripe_Bar +1
divisions\n";

print "D: Will use color: ";
foreach my $C_color (0..$#Color_Stripe_Bar)
{
    printf ("%3i ", $C_color);
    # print "D: Drawing box: '$C_color'\n";
    my $X1 = ($C_color) * $Config{Block_Size} * $Config{Scale};      #Account for off-
center scale: 3,4,5.. to 0,1,2 for plotting
    my $X2 = ($C_color +1) * $Config{Block_Size} * $Config{Scale};
    # print "D: X1 = '$X1', X2 = '$X2', ";
    #print "D: Will use color = '$Color_Stripe[$C_color]', i.e. A_color: $A_color; C_color:
$C_color;
    printf ("%2i ", $C_color);
    $Color_Stripe_IMG -> filledRectangle ($X1,0,$X2,$Config{Block_Size} *
$Config{Scale}, $Color_Stripe_Bar[$C_color]);
    $Color_Stripe_IMG -> rectangle ($X1, 0 , $X2-1, $Config{Block_Size} *
$Config{Scale}-1, $Black);
    # $Color_Stripe_IMG -> stringTTF ($Black, "./fonts/arial.ttf", 20, 0,$X1, 20,
$C_color);
}

```

Figure 15i

```

#Highlight the middle part of the scale:
my $C_color = $Color_Stripe/2;
my $X1 = $C_color * $Config{Block_Size};    #Account for off-center scale: 3,4,5.. to 0,1,2
for plotting
my $X2 = ($C_color +1) * $Config{Block_Size};

$Color_Stripe_IMG -> rectangle ($X1 * $Config{Scale},1,$X2 *
$Config{Scale},$Config{Block_Size} * $Config{Scale}-2,$Black);
#open OUTPUT, ">Color_Stripe.png" or die "Cannot open output file: 'Color_Stripe.png'\n";

#print OUTPUT $Color_Stripe_IMG -> png ();          #Thankfully OO! The difficult bit!
#close OUTPUT;                                     #Will close anyway...
}

#####SUB START
#sub Draw_Classification_Stripe {
#HEY! This doesn't do anything!!!!
#open OUTPUT, ">Classification_Stripe.png" or die "Cannot open output file:
'Classification_Stripe.png'\n";
#print OUTPUT $Classification_Stripe_IMG -> png ();          #Thankfully OO! The difficult
bit!
#close OUTPUT;                                     #Will close anyway...
#}

#####SUB START
sub Load_Configuration {
#This loads configuration into the main Config hash array. Defaults are given first:
$Config{Block_Size} = 16;    #The size (in Pixels) of each block.
#File names: Hard Wired in version 1_1!

$Config{Clinical_Data_File} = "./csv/Tabel AML clinical and molecular data
23_07_2003.csv";    #The name of the Clinical Datafile (Comma delimited format).
$Config{Output_File} = "485Output.png";    #Name of the
final generated image.
#Other parameters:
$Config{Block_Lines} = "F"; #Whether to draw lines round the (inside) of
the blocks

#NB: Reduces colored area by 1 pixel in both
dimensions
$Config{Draw_Color_Stripe} = "T"; #Should a Key be prepared?
$Config{Color_Strips} = 40;    #The number of intervening colors in the
'Strip'
$Config{Minimum} = -1;    #Assumed minmum of correlation data
$Config{Maximum} = +1;    #Assumed minmum of correlation data
$Config{Scale} = 5;    #The multiplication factor for relative
to $Block_Size of the Blocks in the Color Stripe
$Config{Correlation_File} = "./362
View all clustered columnsets .csv";
$Config{Correlation_File} = "./incoming/485genes.csv";
$Config{Header_Col_1} = "FAB";
$Config{Header_Col_2} = "WBC";
$Config{Header_Col_3} = "FLT3 ITD";
#$Config{Header_Col_4} = "FLT3 TKD";
$Config{Header_Col_5} = "os";
$Config{Header_Col_6} = "efs";
$Config{Header_Col_7} = "EVI1";
$Config{Header_Col_8} = "CEBP mutant";
$Config{Header_Col_9} = "osi";

$Config{Mark_Nulls} = "SPOT";

$Config{Mark_Patient_Data} = "Y";
$Config{Marked_Patient} = "XXXXXXXXXXXXXXXXXXXX";    #Inserts a black
line to demonstrated correspondence / registry between patient CC and classification type.
$Config{Label_Classes} = "Y";

```

Figure 15j


```

$Config{Second_Scale_Spacing} = $Config{Block_Size} * 10; #The spacing between the
first and the second scale...*10 sets this to ~130% the length of the first scale
$Config{Low_Blood_Count} = 100; #These were set by MJM because they were "nice
round numbers" they have no scientific justification
$Config{Med_Blood_Count} = 150; #
$Config{Hi_Blood_Count} = 200; #
$Config{Blood_Count_Max} = 300; #
$Config{EFS_Max} = 166;
$Config{OS_Max} = 166;
$Config{Graph_Space} = 250;
$Config{Font_Size} = 15;
#print "D: Reading Configuration Information from STDIN:\n";
#my $Keys_Read=0;
#my @STDIN= <STDIN>;
#if ($STDIN[0] eq "") {return;}
#foreach (@STDIN)
# {
#     chomp ();
#     unless (/=/) {die "Error reading cofiguration file: Pattern expected
is:\n'Parameter = Value'\nWhat was found was: '$_'\n";}
#     s/ //g; #Kill all spaces
#     (my $Key , my $Value) = split ("=", $_);
#     print "D: Key = '$Key' ; Value = '$Value'\n";
#     $Keys_Read ++;
# }
#print "D: Finished reading config file: In total '$Keys_Read' extra parameters read\n";
}

#####SUB START
sub Mark_Patient_Data {
#Find number of Colors needed (i.e. find number of cateregories:
my $Black = $Image -> colorAllocate (0,0,0);
my $Yellow = $Image -> colorAllocate (255,255,0); #M6
my $Cyan = $Image -> colorAllocate (0,255,255); #M5
my $Maroon = $Image -> colorAllocate (176,48,96); #M4
my $Orange = $Image -> colorAllocate (255,165,0); #M3
my $Pink = $Image -> colorAllocate (255,105,180); #M2
my $D_Green = $Image -> colorAllocate (85,107,47); #M1
my $Green = $Image -> colorAllocate (0,255,0); #M0
my $Red = $Image -> colorAllocate (255,0,0);
my $Soft_Green = $Image -> colorAllocate (128,255,128);
my $Soft_Red = $Image -> colorAllocate (255,128,128);
my $Low=$Image -> colorAllocate (32,32,32); #12.5% Grey: Low Blood Cell count
my $Med=$Image -> colorAllocate (128,128,128); #50% Grey: Medium Blood Cell count
my $Hi = $Image -> colorAllocate (214,214,214); #87.5% Grey: High Blood Cell count

foreach my $row (0..$#Matrix) #Cycle through all rows
{
    my ($x1, $y1, $x2, $y2); # $row; my $Y = $row;
    $x1 = $Config{Block_Size} * $row; $x2 = $x1 + $Config{Block_Size}; #Top left to
    Bottom right of a square
    $y1 = $x1; $y2 = $y1 + $Config{Block_Size}-1;
    #This is the diagonals of the square....
    my $x_cent = int ( ($x2 - $x1 ) /2) + $x1; my $y_cent = int ( ($y2 - $y1 ) /2) +
    $y1; #The center might be useful...calculation is over complex, but hey - it's standard!
    my $C_Class = $Classification_1{$Patient_ID{$row}}; #Just a convenience
    really....
    print "D: Classification of Patient ($Patient_ID{$row}) #'$row' = '$C_Class'\n";
    $Image -> filledRectangle ($x1, $y1, $x2, $y2, $White); #Blank blocks on
    diagonal
    #print "D: $Color_Stripe, @Color_Stripe\n"; #Note down
    the index of the color just allocated in a 'look-up' table
    #print "D: Allocating White: < As mid point >";

#Ok! This is where the logic begins...
#Do classification #1: FAB Type:
    if ($C_Class =~ m/Mx/)
    {
        #Ie. A mixed system...
        #Draw Spot....
        print "D: Mixed classification found - drawing spot\n";
    }
}

```

Figure 15k

```

#           $Image -> line ($x1,$y1,$x2,$y2,$Black);

           $Image -> arc ($x_cent,$y_cent,$Config{Block_Size}, $Config{Block_Size}, 0
,360 , $Black);
           $Image -> fill ($x_cent,$y_cent, $Black);
           print "D: Diagonal block runs: $x1, $y1 through center at $x_cent, $y_cent
to: $x2, $y2\n";
       }
       if ($C_Class eq "")
       {
           #Ie. Missing Classification...
           print "D: Missing Classification: Drawing a cross\n";
           $Image -> line ($x1, $y1, $x2, $y2, $Black);
           $Image -> line ($x2, $y1, $x1, $y2, $Black);
#           next;           #Easy eh? (-)
       }

       if ($C_Class =~ m/M/ and not $C_Class =~ m/Mx/)
       {
           my $Block_color;
           my $Catergory = substr ($C_Class, 1,1);
           print "D: Category = '$Catergory'\n";
#           $Block_color = $Cat_bottom_color + $Catergory;
           if ($Catergory == 6) {$Block_color = $Yellow;}
           if ($Catergory == 5) {$Block_color = $Cyan;}
           if ($Catergory == 4) {$Block_color = $Maroon;}
           if ($Catergory == 3) {$Block_color = $Orange;}
           if ($Catergory == 2) {$Block_color = $Pink;}
           if ($Catergory == 1) {$Block_color = $D_Green;}
           if ($Catergory == 0) {$Block_color = $Green;}
           print "D: Will use color: '$Block_color'\n";
           $x2 = $x1 + 20*$Catergory+$Config{Block_Size} -1;
           $Image -> filledRectangle ($x1, $y1, $x2, $y2, $Block_color);
           if ($Config{Label_Classes} eq "Y")
           {
               $Image -> stringTTF ($Black, "./fonts/Courier.ttf", 15, 0, $x2+10,
$y2, $Catergory);
           }
       }

       $Patient_IDs -> stringTTF ($Black, "./fonts/Courier.ttf", $Config{Font_Size}, 0, 1,
$y2,$Patient_ID{$row});
       if ($Patient_ID{$row} eq $Config{Marked_Patient})           #This is used to check
the 'register' between the CC data and the Patient Classification.
       {
#           my $Block_color = $Black;
           my $Catergory = substr ($C_Class, 1,1);
           print "D: Marking Patient: '$Patient_ID{$row}' using color: BLACK\n";
           my $Catergory = 10;
           $Image -> filledRectangle ($x1, $y1, $x2 + 20 * $Catergory, $y2, $Black);
       }

#Now something similar for classification #2 (Blood Cell Count):
       $x1=$x1 + $Config{Graph_Space};           #ie. give some space between the two scales
       $x2 = $x1 + $Config{Block_Size};
       my $Blood_Count = $Classification_2{$Patient_ID{$row}};
       print "D: Blood count = '$Blood_Count'\n";
       if ($Blood_Count == undef)
       {
           print "D: Missing Blood Count Classification: Drawing a cross\n";
           $Image -> line ($x1, $y1, $x2, $y2, $Black);
           $Image -> line ($x2, $y1, $x1, $y2, $Black);
       }
       else
       {
           my $Bar_Length = $Blood_Count / $Config{Blood_Count_Max} * 200;
           Draw_blood_bar ($Med, $Blood_Count,$x1, $y1, $Bar_Length);
       }
       # $Config{Blood_Count_Max}

#Now something similar for classification #3 (FLT ITD):
       $x1=$x1 + $Config{Graph_Space};           #ie. give some space between the two scales

```

Figure 15l

25/27

```

my $FLT_Class = $Classification_3{$Patient_ID{$row}};
print "D: FLT3 Class = '$FLT_Class' for Patient: '$Patient_ID{$row}'\n";
if ($FLT_Class eq "")
{
    print "D: Missing FTL Classification: Drawing a cross\n";
    $x2 = $x1 + $Config{Block_Size};
    $Image -> line ($x1, $y1, $x2, $y2, $Black);
    $Image -> line ($x2, $y1, $x1, $y2, $Black);
}
else
{
    if ($FLT_Class =~ m/Pos/i or $FLT_Class =~ m/Yes/i)
    {
        $x2=$x1 + 150;
        $Image -> filledRectangle ($x1, $y1, $x2, $y2, $Soft_Red);
        $Image -> stringTTF ($Black, "./fonts/Courier.ttf",
$Config{Font_Size}, 0, $x2+10, $y2-2, "Pos");
    }
    else .
    {
        $x2=$x1 + 75;
        $Image -> filledRectangle ($x1, $y1, $x2, $y2, $Soft_Green);
        $Image -> stringTTF ($Black, "./fonts/Courier.ttf",
$Config{Font_Size}, 0, $x2+10, $y2-3, "Neg");
    }
}

#Now something similar for classification #5 (OS):
$x1=$x1 + $Config{Graph_Space};      #ie. give some space between the two scales
$x2 = $x1 + $Config{Block_Size};
my $OS = $Classification_5{$Patient_ID{$row}};
print "D: OS = '$OS'\n";
if ($OS eq "")
{
    print "D: Missing OS Classification: Drawing a cross\n";
    $Image -> line ($x1, $y1, $x2, $y2, $Black);
    $Image -> line ($x2, $y1, $x1, $y2, $Black);
}
else
{
    my $Bar_Length = $OS / $Config{OS_Max} * 200;
    Draw_blood_bar ($Med, $OS,$x1, $y1, $Bar_Length);
}
#$Config{Blood_Count_Max}

#Now something similar for classification #6 (EFS):
$x1=$x1 + $Config{Graph_Space};      #ie. give some space between the two scales
$x2 = $x1 + $Config{Block_Size};
my $EFS = $Classification_6{$Patient_ID{$row}};
print "D: $Patient_ID{$row} EFS = '$EFS'\n";
if ($EFS eq "")
{
    print "D: Missing EFS Classification: Drawing a cross\n";
    $Image -> line ($x1, $y1, $x2, $y2, $Black);
    $Image -> line ($x2, $y1, $x1, $y2, $Black);
}
else
{
    print "D: Testing Dead/ alive status:
'", $Classification_9{$Patient_ID{$row}}, "'\n";
    my $Bar_Length = $EFS / $Config{EFS_Max} * 200;
    if ($Classification_9{$Patient_ID{$row}} eq "alive")
    {Draw_blood_bar ($Soft_Green, $EFS,$x1, $y1, $Bar_Length);}
    else
    {Draw_blood_bar ($Soft_Red, $EFS,$x1, $y1, $Bar_Length);}
}

```

Figure 15m

26/27

```

#Now something similar for classification #7 (EVII):
  $x1=$x1 + $Config{Graph_Space};      #ie. give some space between the two scales

  my $EVII_Class = $Classification_7{$Patient_ID{$row}};
  print "D: EVII Class = '$EVII_Class' for Patient: '$Patient_ID{$row}'\n";
  if ($EVII_Class eq "")
  {
    print "D: Missing EVII Classification: Drawing a cross\n";
    $x2 = $x1 + $Config{Block_Size};
    $Image -> line ($x1, $y1, $x2, $y2, $Black);
    $Image -> line ($x2, $y1, $x1, $y2, $Black);
  }
  else
  {
    if ($EVII_Class =~ m/Pos/i or $EVII_Class =~ m/Yes/i)
    {
      $x2=$x1 + 150;
      $Image -> filledRectangle ($x1, $y1, $x2, $y2, $Soft_Red);
      $Image -> stringTTF ($Black, "./fonts/Courier.ttf",
$Config{Font_Size}, 0, $x2+10, $y2-2, "Pos");
    }
    else
    {
      $x2=$x1 + 75;
      $Image -> filledRectangle ($x1, $y1, $x2, $y2, $Soft_Green);
      $Image -> stringTTF ($Black, "./fonts/Courier.ttf",
$Config{Font_Size}, 0, $x2+10, $y2-3, "Neg");
    }
  }
}
#CEBP mutant to go in!
#Now something similar for classification #8 (CEBP):
  $x1=$x1 + $Config{Graph_Space};      #ie. give some space between the two scales

  my $CEBP_Class = $Classification_8{$Patient_ID{$row}};
  print "D: CEBP Class = '$CEBP_Class' for Patient: '$Patient_ID{$row}'\n";
  if ($CEBP_Class eq "")
  {
    print "D: Missing CEBP Classification: Drawing a cross\n";
    $x2 = $x1 + $Config{Block_Size};
    $Image -> line ($x1, $y1, $x2, $y2, $Black);
    $Image -> line ($x2, $y1, $x1, $y2, $Black);
  }
  else
  {
    if ($CEBP_Class =~ m/Pos/i or $CEBP_Class =~ m/Yes/i)
    {
      $x2=$x1 + 150;
      $Image -> filledRectangle ($x1, $y1, $x2, $y2, $Soft_Red);
      $Image -> stringTTF ($Black, "./fonts/Courier.ttf",
$Config{Font_Size}, 0, $x2+10, $y2-2, "Pos");
    }
    else
    {
      $x2=$x1 + 75;
      $Image -> filledRectangle ($x1, $y1, $x2, $y2, $Soft_Green);
      $Image -> stringTTF ($Black, "./fonts/Courier.ttf",
$Config{Font_Size}, 0, $x2+10, $y2-3, "Neg");
    }
  }
}

next;
}
#return ($Cat_bottom_color, $Number_of_colors);
}

sub Draw_blood_bar {
(my $color, my $Count, my $x, my $y, my $Length) = @_;
$Image -> filledRectangle ($x, $y, $x + $Length, $y + $Count*Size-1, $color);

```

Figure 15n


```

$Image -> stringTTF (1, "./fonts/Courier.ttf", $Config{Font_Size}, 0, $x + $Length + 10, $y
+ $Config{Block_Size}-1, int ($Count));

}

#####START SUB
#sub Draw_Classification_Stripe {
#Er?  Finishing this would be a good idea....
#Hey!  This doesn't do anything!
#for my $C_Class (1..$Classes)
#    {

#    }
#}

sub Label_Class {
(my $x, my $y, my $Cat) = @_;
print "D: LABEL_CLASS: Got the data: [X,Y,Cat] '$x' , '$y', '$Cat' passed\n" ;
}

sub Top_Color_Print {

print "D:      [Allocating new color of index: '$Top_Color']\n";
$Top_Color ++;
}

sub Allocate_Cateryory_range {
my %Classes;
my $Number_of_Classes=0;
foreach my $C_Patient (keys %Classification_1)          #Cycle through all
classifications
{
#    print "D: Classification of Patient: '$C_Patient' =
'$Classification_1{$C_Patient}'\n";
#    unless (exists $Classes{$Classification_1{$C_Patient}})    #Check whether this
classification has been seen before.
#    {
#        print "D: Found new Class: '$Classification_1{$C_Patient}'\n";
#        $Classes{$Classification_1{$C_Patient}} = $Classification_1{$C_Patient};
#        #Add it to the Hash Array
#        $Number_of_Classes ++;
#        #Add 1 to the tally of classes
#    }
}

print "D: Number of FAB Classes (patient catergories)  = '$Number_of_Classes'\n"; #Useful to
know
print "D:      Allocate 'Cateryory Colors': \n";
my $CC_max_color = $#Color_Stripe;
my $Cat_bottom_color = $CC_max_color + 3;
print "D: Last Color Allocated for CC Matrix: $CC_max_color '$Cat_bottom_color'\n";
my $Number_of_colors = $Number_of_Classes - 3;
foreach my $C_Color (0..$Number_of_colors)  #Ie, pickup where the CC data left off
{
    printf ("%3i ", $C_Color);
    my $Red_level = int (255 / $Number_of_colors * $C_Color);  #The (complex)
calculation for the color level
    print "D: For $C_Color: Red_level (needed to alter Green to Yellow) = '$Red_level',
i.e. Color:", ($C_Color+$Cat_bottom_color), "\n";
    #works for the red as well but
    without the "255-" part
    #    push @Color_Stripe,
$Image -> colorAllocate ($Red_level,255,0);
}

my $Cat_top_color = $#Color_Stripe;          #Don't think this is actually used...nice to
know though!
print "D: Catergory colors will range from: $Cat_bottom_color to '$Cat_bottom_color +
$Number_of_colors', '\n";
}

```

Figure 15o

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